Citation:

Almanza BA, Namkung Y, Ismail JA, Nelson DC. Clients' safe food-handling knowledge and risk behavior in a home-delivered meal program. *J Am Diet Assoc.* 2007 May; 107(5): 816-821.

PubMed ID: 17467379

Study Design:

Cross-sectional study

Class:

D - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

NEUTRAL: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To determine the typical handling practices of home-delivered meals and provide appropriate handling instructions to reduce the risk of foodborne illness by improving consumer handling of home-delivered meals.

Inclusion Criteria:

- Geographic dispersion (of home-delivered meal preparation sites) across the United States (states representing six out of 10 regions as divided by the Administration on Aging's Regional Offices were selected)
- Size of program (representing all four quartiles when states are ranked by size)
- Willingness to participate in the study.

Exclusion Criteria:

- Outside the states representing six out of 10 regions as divided by the Administration on Aging's Regional Offices were selected
- Outside of 50 chosen home-delivered meal preparation sites in six states selected
- Inappropriate size of program (not representing all four quartiles when states are ranked by size)
- Lack of willingness to participate in the study.

Description of Study Protocol:

Recruitment

- 833 clients from 50 home-delivered meal preparation sites in six states were selected on the following basis:

    - Geographic dispersion across the US (states representing six out of 10 regions as divided by the Administration on Aging's Regional Offices) were selected
    - Size of program (representing all four quartiles when states are ranked by size)
    - Willingness to participate in the study.
- Twenty home-delivered meal preparation sites in four states, including Indiana (395 participants from eight sites), Texas (249 participants from seven sites), Washington (119 participants from three sites) and New Hampshire (106 participants from two sites) participated in the study. Two states that had agreed to participate did not respond to this portion of the project.

Design

- Once permission was given by home-delivered meal site directors, subjects were provided a voluntary survey and requested by the home-delivery drivers to complete the self-administered questionnaire. The completed questionnaire was collected by the driver the following day. The questionnaire was made easy and convenient to answer (e.g., using larger fonts). A driver questionnaire was also used to track the departure time from the meal preparation site, the arrival time of each home-delivered meal at the subject's home and the length of time the meal was held in the home before consumption
- Subjects were classified for the purposes of data analysis into high-risk, neutral or low-risk groups, based on the degree to which the subjects responded correctly to proper food handling procedure scenarios
- Follow-up with sites was done to encourage responses and answer questions regarding administration of surveys
- The client questionnaire was used to assess how home-delivered meals were handled, including how meals were held before consumption, length of time between delivery and consumption, handling of leftovers before consumption, demographics and general food safety knowledge.

Blinding Used

Questionnaires completed by the participants were sealed in envelopes to protect client anonymity and collected by the meal delivery drivers the following day.

Statistical Analysis

- Microsoft Excel (version 10.0, 2002, Microsoft Corp., Redmond, WA) was used to enter the data from the questionnaires and calculate the time for delivery and consumption of meals
- Statistical analysis was performed with SPSS (version 12.0, 2003, SPSS Inc, Chicago, IL) for descriptive analysis (frequency, and x^2 test) of participants' handling of home delivered meals, general food safety knowledge and demographic information.

Data Collection Summary:

Timing of Measurements

- This study was conducted from 2003 through 2004
- Clients were provided a voluntary survey and requested by the delivery drivers to complete the self-administered questionnaire; completed questionnaires were collected by the delivery drivers the following day
- Driver questionnaires, which tracked the departure time from the meal preparation site, the arrival time of each home-delivered meal at the client's home and the time the meal was held in the home before consumption, were also collected.

Dependent Variables

- Respondent's safe food handling practices
- Respondent's food safety knowledge
- Average time of delivery of home-delivered meal
- Average time of consumption of home-delivered meal.

Four scenarios that reflected proper food handling habits were evaluated as to the level of concern in terms of food safety knowledge reflected in each scenario. Respondent would indicate their level of agreement on a scale of strongly agree, agree, disagree or strongly disagree. If respondent responded correctly to the proper food-handling procedure, they were given one point, else they were given zero points. This point system was used to classify subjects as part of a high-risk group, neutral or low-risk group based on the score computation.

Independent Variables

- Age
- Gender
- Risk behaviors of respondents (high-risk group, neutral or low-risk group)
- Time within which food was consumed after delivery
- Temperature at which food was consumed after delivery.

Description of Actual Data Sample:

- *Initial N:* 869 clients participated in this study, although not all respondents answered all questions
- *Attrition (final N):*
  - Because of respondents' advanced age and serious health complications, 833 responses were considered usable with the majority of questions completed
  - Among the 833 responders, 258 were male (31%) and 575 were female (69%)
  - Regarding clients meal consumption behavior, 851 responses were usable
- *Age:* Mean age of 79.5 years
  - 10.3% were less than 64 years
  - 17.5% were 65 to 74 years
  - 36.6% were 75 to 84
  - 35.6% were 85 or older
- *Other relevant demographics:* Respondents from four states, including:

- Indiana (395 participants)
- Texas (249 participants)
- Washington (119 participants)
- New Hampshire (106 participants)

- Location: Indiana, Texas, Washington, New Hampshire.

Summary of Results:

Key Findings

- Significant differences among groups on the basis of a derived food safety knowledge score were observed in terms of whether or not they ate their meal immediately ($P \leq 0.05$)
- 63% reported that they ate their meals as soon as they were delivered
- 37.7% did not keep hot food safe after meals were delivered and instead left the food on a counter or table
- Of the subjects who did not eat their meals immediately, 82% stored the cold food in the refrigerator and 58% stored the hot food in the freezer
- 57.1% who ate meals immediately did not reheat the foods before eating them even though those meals were not perceived as hot
- 35% reported that they had leftovers and only 15% ate the leftovers within two hours, 41% reported that they ate leftovers between four hours and four days after delivery

Other Findings

- Results suggested that the majority of respondents had a medium level of food safety knowledge in dealing with home-delivered meals
- When the time variable was considered, 839 clients responded that, on average, meals were consumed 1.22 hours after the drivers delivered them
- The average time spent from packing at preparation sites to delivery to the 839 clients was 1.95 hours; thus, it took 3.17 hours from onsite preparation to offsite consumption
- A second order polynomial trend-line was fit to the data and helps to show that the total time period from preparation at the sites to the time of consumption depends primarily on the time of consumption after delivery, rather than the time required for delivery.

Author Conclusion:

- This study suggests that time in conjunction with temperature must be controlled to reduce foodborne illness caused by improper food handling
- Clients should be informed that it is best to eat the meals immediately or refrigerate them and then reheat them when ready
- Although food preparation and delivery operations appear to be doing a credible job of controlling both time and temperature, there is clearly room for improvement in client handling procedures
- Clients whose food-handling knowledge scores were low tended to exhibit the most risky food-handling behavior and would likely benefit from literature or training on proper handling of home-delivered meals
- Consumers need more information on handling meals in their homes and a better understanding of the importance of proper handling for prevention of foodborne illness

- Continued efforts from food-service providers on holding, handling and packaging of home-delivered meals are needed to help protect this at-risk consumer group, along with new efforts to educate clients and promote proper handling once meals are delivered.

Reviewer Comments:

The authors did not indicate funding sources, and data is based on self-report.

Authors noted these limitations:

- *Participants had to hand back envelopes with completed survey to the driver regardless of whether sealed or not; some subject may have been uncomfortable with the idea that the driver might read negative comments*
- *Reliance on participant's subjective opinion to determine their perception of food temperature.*

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions		
1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	Yes
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	Yes

Validity Questions		
1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	???

2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
3.	**Were study groups comparable?**	N/A
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	N/A
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	N/A
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	N/A
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	No
4.1.	Were follow-up methods described and the same for all groups?	No
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	No
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	No
4.4.	Were reasons for withdrawals similar across groups?	N/A
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	N/A
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A

5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	N/A
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	N/A
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	N/A
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	N/A
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	N/A
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	N/A
7.6.	Were other factors accounted for (measured) that could affect outcomes?	N/A
7.7.	Were the measurements conducted consistently across groups?	N/A

8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**		Yes
	8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
	8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
	8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
	8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
	8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	N/A
	8.6.	Was clinical significance as well as statistical significance reported?	Yes
	8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**		Yes
	9.1.	Is there a discussion of findings?	Yes
	9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**		???
	10.1.	Were sources of funding and investigators' affiliations described?	No
	10.2.	Was the study free from apparent conflict of interest?	???